Development of a Scientific Visualization Tool for Vehicle Dynamics

Nancy Rowe
Army High Performance Computing Research Center
Minneapolis, MN

Dan Kedziorek
US Army TACOM-TARDEC
Warren, MI

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TARDEC Virtual Prototyping Group

- Define and develop computer based vehicle models
- Moving towards virtual fabrication and testing
- Customer support team
- Using a combination of commercial and custom software

DADS

- Dynamic Analysis And Design System
- LMS CADSI mechanical simulation program
- Vehicle dynamics

Design Goals

- Replace SGI-bound legacy visualization code
- Portable
- Libraries - free, non-proprietary, commonly used, stable, well-supported, C-binding

2 part code structure

- User Interface
- Application specific code

User Interface

- Viewer Framework
- Developed at the AHPCRC
- Library of graphical routines
- Reusable
- Portable
- Facilitates rapid development

Application code

- Reads data
- Reads wheeled or tracked vehicles
- Draws the model
- Writes files

Data Files

- PAR - DADS positional analysis for rigid bodies
- GEO - geometry information; Movie.BYU format
- LIST - list of geometry files
- CLR - color information
- SET - initial setup file; information about all the other files

Tcl/Tk

- Used to build GUI
- Tcl - Tool Command Language - scripting language
- Tk - Motif-like Toolkit for X11
- Interpreted language
- Multi-platform

OpenGL

- Library for graphics functions
- Widely used
- Stable
- Well documented
- Multi-platform

Image Magick

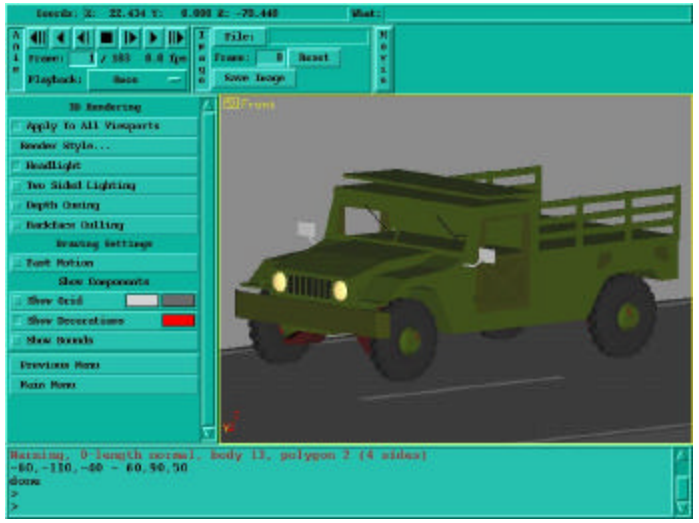
- Tools and libraries for image manipulation
- Used to create images and animations
- 68 major formats
- Multi-platform

Stand-alone Executable

- Mktclapp - wrapper code
- From Hipp, Wyrick & Company - Hwaci
- Mix C/C++ with Tcl/Tk to create standalone executable
- Wrapper code available free of charge

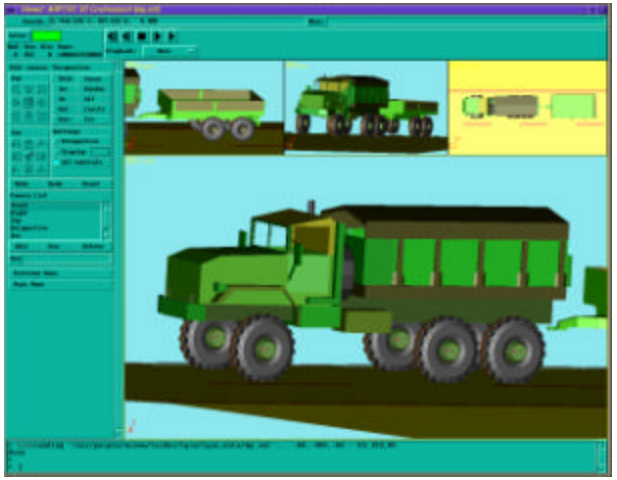
Features of AHPCRC DADS visualizer

- Portable
- “Mouse”able
- Rotate, translate, scale transformations with a single mouse button
- Zoom in/out
- See up to 4 cameras at one time
- Multiple layouts
- Update drawing style in all cameras at one time
- Reset camera
- Undo/redo changes
- Show/hide changes
- Choice of display style - points, wireframe, flat shaded, smooth shaded



Features of AHPCRC DADS visualizer (continued)

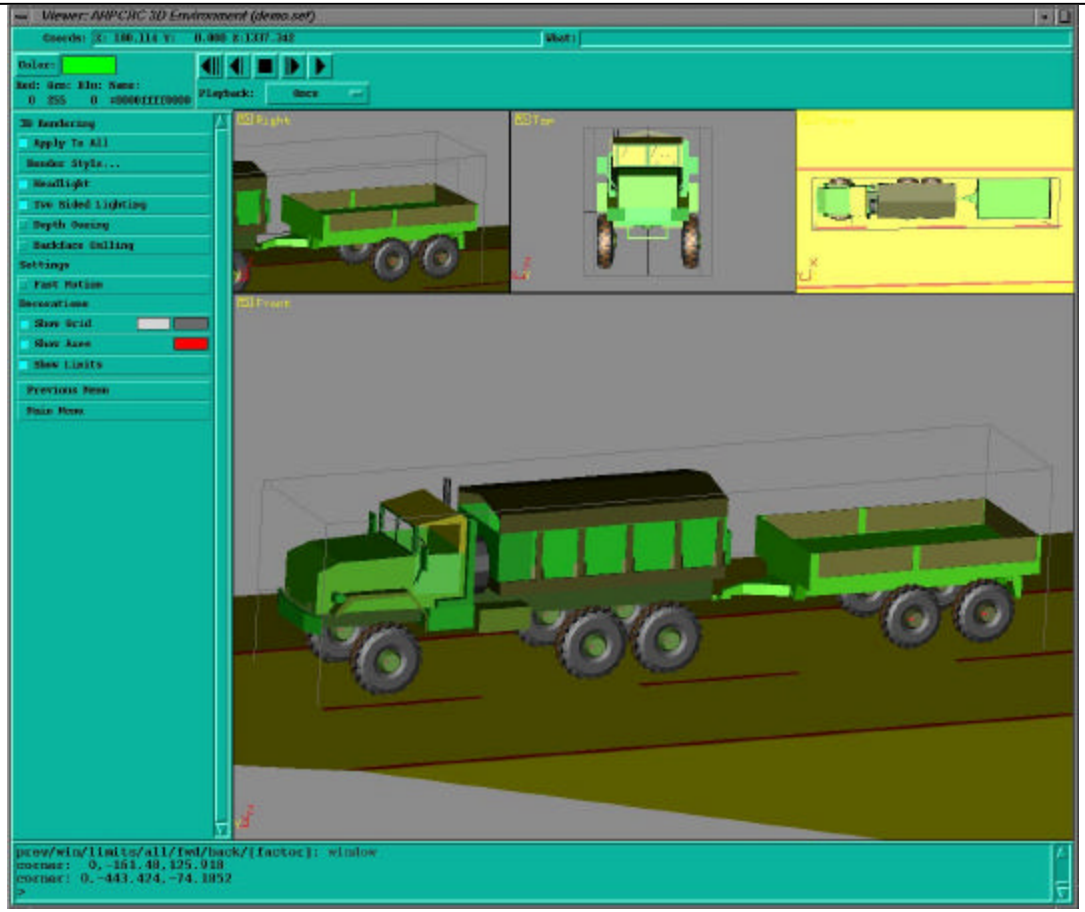
- Depth cueing
- Backface culling
- Perspective or orthographic display
- Change background color
- Toggle display accessories - axes, limits, grid
- Fast motion drawing
- Choice of lighting
- Write MPEG animations
- Save images
- Single frame animation
- 3 animation modes



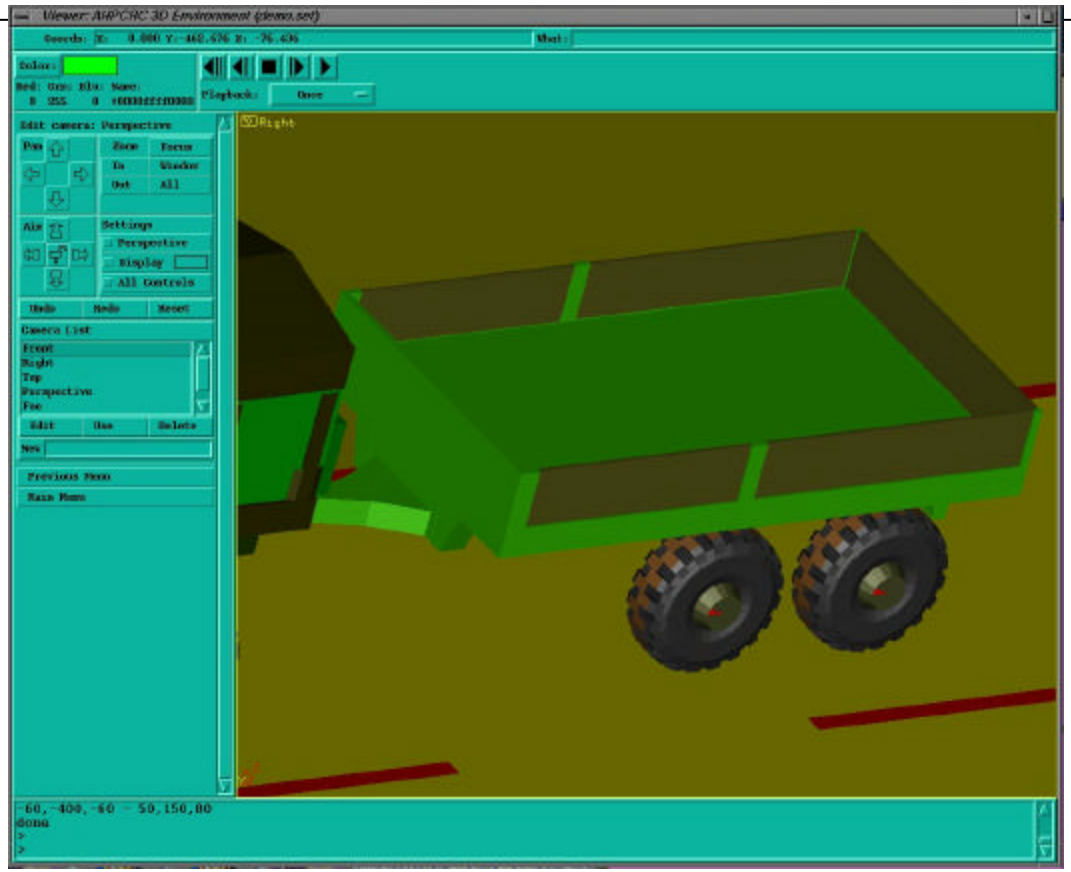
Plans

- Utilize code in virtual environment
- Add features, including texturing, transparency
- Improve NT version

Multiple cameras allow the user to see more things at one time



The camera menu lets the user easily zoom and pan. Mistakes can be corrected with “Undo” and “Redo”.



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